CLAIMS

What is claimed is:

1.   A method for processing upstream packets of an optical network, comprising the steps of:

for a group of subscriber optical interfaces in the optical network,

receiving status messages from the subscriber optical interfaces;

calculating reservation information for upstream transmission from the status messages;

calculating a duration of upstream transmission time slots for each subscriber optical interface; and

transmitting the calculated the duration of the upstream transmission time slot to each subscriber optical interface; and

receiving upstream transmissions from each subscriber optical interface during respective calculated upstream transmission time slots.

2.   The method of claim 1, wherein each status message indicates how much data that may be forwarded by a subscriber optical interface.

3.   The method of claim 1, wherein the step of calculating a duration of upstream transmission time slots further comprises the steps of:

determining whether a subscriber optical interface is active; and

evaluating a queue size of a subscriber optical interface.

4.   The method of claim 1, wherein the step of calculating a duration of upstream transmission time slots further comprises the step of filtering an offered load for a subscriber optical interface in the time domain.

5.   The method of claim of claim 1, wherein the step of calculating a duration of upstream transmission time slots further comprises the step of adding to a token bucket a number of tokens that are approximately equal to a sustained rate of a subscriber optical interface.

5

6.   The method of claim 1, further comprising the step of determining whether to hold upstream packets at a subscriber optical interface prior to transmission if an upstream transmission timeslot is not large enough to accommodate the upstream packets.

10

7.   The method of claim 1, further comprising the step of determining whether to receive upstream packets from a particular subscriber optical interface based upon whether how much data other subscriber optical interfaces in a same subscriber group are planning to send.

15

8.   The method of claim 1, further comprising the step of determining whether to receive upstream packets from a particular subscriber based upon whether a service level granted to a subscriber optical interface.

20   9.   A computer-readable medium having computer-executable instructions for performing the steps recited in claim 1.

10.   An optical network system comprising:

a plurality of subscriber optical interfaces; and

an optical tap routing device coupled to the plurality of subscriber optical interfaces, said optical tap routing device further comprising a memory device and central processing unit coupled to said memory device, wherein said central processing unit is programmed to perform the steps of:

calculating a length of a time interval for upstream transmission by a subscriber with a token bucket algorithm; and

obtaining at least one packet from each subscriber of the plurality of subscriber optical interfaces during the time interval such that collision of packets originating from different subscribers of the plurality of subscribers is substantially reduced.

11.   The optical network system of claim 10, wherein the central processing unit is further programmed to perform the steps of:

monitoring a bandwidth of a first subscriber optical interface; and

offering a portion of the bandwidth not used by the first subscriber optical interface to one or more other second subscriber optical interfaces.

12.   The optical network system of claim 10, wherein the central processing unit is further programmed to perform the step of determining whether to receive upstream packets from a particular subscriber based upon whether a service level granted to a subscriber optical interface.

13.   A method for processing upstream packets of an optical network, comprising the steps of:

for a group of subscribers in the optical network,

receiving a request from a subscriber to transmit one or more upstream packets;

determining whether the one or more upstream packets can be processed;

sending a message to the subscriber indicating whether the one or more upstream packets can be processed; and

receiving the upstream packets if it is determined that the one or more upstream packets can be processed.

14.   The method of claim 13, wherein the step of determining whether upstream packets can be processed further comprises the step of calculating available upstream bandwidth with a token bucket algorithm.

15. The method of claim 13, wherein the step of determining whether upstream packets can be processed further comprises the step of calculating available upstream bandwidth based upon what other upstream packets other subscribers are planning to transmit.

16.   The method of claim 13, wherein the step of determining whether upstream packets can be processed further comprises the step of determining an upstream bandwidth subscription service level of a subscriber.

17.   The method of claim 13, wherein the step of determining whether upstream packets can be processed further comprises the step of calculating available upstream bandwidth based upon a total upstream data traffic load that is destined for the data service hub.

18.   The method of claim 13, wherein the step of sending a message further comprises the step of sending a message indicating an amount of packets that can be transmitted upstream by a subscriber.

5   19.   The method of claim 13, further comprising the step of discarding holding the upstream packets at the subscriber if it is determined that the one or more upstream packets cannot be processed.

20.   The method of claim 13, further comprising the step of

10   allocating bandwidth between subscriber optical interfaces according to a weighted max-min mathematical algorithm.

21.   A computer-readable medium having computer-executable instructions for performing the steps recited in claim 13.

15

22.   The method of claim 1, wherein the step of calculating the duration of the upstream transmission time slots further comprises calculating the duration with a token bucket emulation algorithm.